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Nauro F. Campos

Back to the Future: The Growth Prospects of Transition Economies Reconsidered

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BACK TO THE FUTURE: THE GROWTH PROSPECTS OF TRANSITION ECONOMIES RECONSIDERED*

Nauro F. Campos**
CERGE-EI, Prague,
Centre for Economic Policy Research, London, and
William Davidson Institute at the University of Michigan.

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Abstract. How many years will the average transition economy need to reach the income level of the average OECD country? The favored methodology in use to answer such questions is referred to as the *BLR approach*, because it uses specifications from Barro, and Levine and Renelt. The literature has so far refrained from identifying and testing the underlying assumptions of the *BLR approach*. This paper attempts to fill this gap. Our results contrast sharply with the assumptions and findings from the *BLR approach*, questioning its might and challenging our understanding of the transition process in its key dimension.

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** CERGE-EI, P.O. Box 882, Politických vězňů 7, 111 21 Prague 1, Czech Republic. E-mail: nauro.campos@cerge.cuni.cz

1. INTRODUCTION

How many years will the average transition economy need to reach the income level of the average OECD country? What will be the average growth rates of the transition economies for the next thirty years? How fast will the average transition economy “catch-up” with the poorest members of the European Union? How long will it take for all the “command economy features” to disappear from these economies? And once they disappear, which transition economies need be treated as developing countries? These are important inter-related questions. And difficult ones too because the transition experience, paradoxically, justifies *and* entraps the available answers. It justifies them by appealing to the fact that transition is temporary: after a while, the standard set of growth determinants will take over. On the other hand, the uniqueness of the transition experience entraps the available answers because it questions whether and how fast the transition —as well as the remaining command— features will disappear.[1]

The focus of the burgeoning literature addressing these questions is on growth prospects and hence concerns estimating, or forecasting, long-run growth rates. The methodology favored in this literature is here referred to as the Barro-Levine-Renelt (hereafter, *BLR*) *approach*. It proceeds in two steps, first coefficients from growth regressions (on large samples of developing countries) are estimated (or taken from specifications found in Barro, 1991, and/or Levine and Renelt, 1992), and second these coefficients are imposed

[1] Fisher et al. (1996a) point out that “a useful way to think about the current growth prospects of the transition economies is to consider them subject to two sets of forces: those arising from the transition and transformation process, and the basic neoclassical determinants of growth. The further along a country is in the transition process, the less weight on the factors that determine the transitional growth rate, and the greater the weight on the standard determinants of growth” (p. 231).

on transition economies' cross-sectional data. The literature refrained from highlighting and testing the assumptions buttressing the *BLR approach*. This paper attempts to fill this gap.

The objective of this paper is to discuss the limitations of the available methods for assessing the growth prospects transition economies face, and by doing so, investigate long-run economic growth determinants in these economies.[2] The paper is organized as follows. Section 2 reviews the literature on the growth prospects the transition countries face. Section 3 critically details the mechanics of the *BLR approach*. Section 4 presents the data on transition economies used to re-estimate the *BLR equations*, in Section 5. Our results contrast sharply with the assumptions and findings from the *BLR approach*, questioning its might and challenging our understanding of the transition process in its key dimension. Section 6 concludes.

2. RELATED STUDIES

The objective of this section is to review the literature on the growth prospects the transition economies face. The emphasis is on cross-country studies, in particular, those paying attention not only to Central and Eastern Europe but also to former Soviet Union countries.

The first systematic analysis of growth prospects of transition economies, to the best of our knowledge, appeared in the *World Economic Outlook* (IMF, 1996) in the chapter "Long-Term Growth Potential in the Countries in Transition". It uses the *BLR approach* to simulate the effects of lowering the share of public expenditures (except on education) to 15

[2] For excellent surveys of the growth literature, see Barro and Sala-i-Martin (1995) and Aghion and Howitt (1998). On econometric methodology and empirical evidence see Islam (1995), Lee et al. (1997, 1998), Temple (1999) and Durlauf and Quah (1999). For a survey of the literature on growth in transition, see Campos and Coricelli (2000).

percent of GDP and of raising investment rates to 30 percent of GDP. Not surprisingly, it finds that both changes would increase growth substantially.

Havlik (1996) bypasses the *BLR approach* by assuming a growth rate differential in real per capita GDP of 3 percentage points between the CEEC-7[3] and the European Union average. The question is: given the 1995 levels of real per capita GDP, how many years will the CEEC-7 countries need to catch-up with the EU or, more likely, with its poorer members? Havlik concludes that "convergence between the two most advanced CEEC countries and Spain (…) could not happen before 2005. For the other CEEC members to converge to the EU average by 2010 would require a growth differential of more than 5 per cent, a highly unrealistic assumption" (1996, pp.42-44).

Denizer (1997) stresses that initial conditions matter, as proxied by distance (in miles) from Vienna and whether the country was independent before socialism. For growth prospects, Denizer opts for using only the Levine-Renelt specification on the basis that it "includes variables that are shown to be robust in various specifications of the growth equation" (1997, p. 13). In addition, Denizer extends previous analyses by considering a broader sample of transition economies (adding Mongolia, China and Vietnam). Finally, as a simulation exercise, he evaluates the impact of raising the investment rate to 30 percent from current levels on the number of years these economies will need to reach current OECD income levels.

One important contribution to this literature is made in the European Bank for Reconstruction and Development's *Transition Report 1997* (EBRD, 1997, chapter 6). This Report contrasts the findings on the transition economies' growth prospects that originate from the Levine-Renelt specification with those that originate from an alternative

[3] *CEEC-7* is Hungary, Czech Republic, Poland, Slovak Republic, Slovenia, Bulgaria and Romania.

specification that includes, *inter alia*, an index of institutional development.[4] This suggests a downward revision of the forecasted long-run growth rates: even for those transition economies with relatively high-quality institutions (and for which, institutional data are available), the absence of further institutional change should lower long-term growth rates by 1.5 percentage points.

Fisher, Sahay and Vegh (1997) use coefficients from Barro (1991) and from Levine and Renelt (1992) and cross-sectional data (for 1994) from 15 transition economies to forecast GDP and per capita GDP growth rates. They also conduct two simulation exercises. The first uses the Barro coefficients to investigate the consequences (in terms of the number of years needed to reach current OECD income levels) of lowering government consumption from current levels to 10 percent of GDP. The second uses the Levine and Renelt specification to look at the impact on growth of raising the investment rate to 30 percent of GDP from current levels. In subsequent work (1998), the authors use the *BLR approach* for a smaller sample of transition economies (Central European and Baltic countries) to assess their catching-up prospects with the European Union. They carry out two simulation exercises to estimate the number of years it will be needed to these transition economies to converge to the income levels of the three “low-income EU countries,” Greece, Portugal and Spain, assuming that the latter will grow at 2 per cent per annum. The first simulation uses the Barro specification to investigate the consequences of lowering government consumption from current levels to 10 percent of GDP. The second uses the Levine and Renelt specification to look at the impact on growth of raising the investment rate to 30 percent of GDP, from its

[4] This composite index encompasses “expropriation risk”, “rule of law”, “risk of contract repudiation by the government”, “corruption”, and “quality of the bureaucracy” (EBRD, 1997, p. 106). The “enlarged” Levine-Renelt specification includes enrollment rates in primary school, changes in international prices, and growth of labor force (instead of population growth).

current levels. One innovation this paper brings is a quantification of the income losses incurred during the socialist period: using 1937 data for 6 countries, they estimate that approximately two-thirds of GDP per capita were lost during the socialist experiment.

There are a number of important studies focusing on smaller samples of transition countries. Borenzstein and Montiel (1992) and Sachs and Warner (1996) both examine only three transition countries. The former uses the Mankiw-Romer-Weil framework to identify long term growth paths, while the latter uses three countries' experience to argue that harmonizing with the European Union policy standards will result in lower growth rates than following the policies of the group the authors define as "very fast growing developing economies." Barbone and Zalduendo (1997) modify the *BLR approach* in that they estimate their own theoretical model for a large sample of developing countries and then use the coefficients to discuss accession to the European Union of five candidates.[5]

3. THE BLR APPROACH

The *BLR approach* is ubiquitous. This section discusses it in detail. The *BLR approach* consists of two steps. First, the coefficients from growth regressions on large samples of developing countries are estimated or, more often, "taken" from Barro (1991) and/or Levine and Renelt (1992). The "Barro equation" (and the ordinary least squares estimates) used in the papers reviewed above is:

$$\widehat{GDPGROWTH} = 0.0302 - 0.0075 * Y0 + 0.025 * PRIM + 0.0305 * SEC - 0.119 * GOV,$$

while the "Levine and Renelt equation" (and the ordinary least squares estimates) is:

$$\widehat{GDPGROWTH} = -0.83 - 0.35 * Y0 - 0.38 * POP + 3.17 * SEC + 17.5 * INV,$$

[5] See also Barta and Url (1996) and Fidrmuc (2000).

where *GDPGROWTH* is per capita real GDP growth, *Y0* is the initial level of per capita income, *PRIM* is the gross primary school enrollment rate, *SEC* is the gross secondary school enrollment rate, *POP* is the rate of population growth, *GOV* is the share of government consumption in GDP, and *INV* is the share of investment in GDP.

The second step in the *BLR approach* is to impose these coefficients on transition economies' data in the following manner. First, data for a set of transition economies are collected on all *BLR variable*s, often for 1994 or 1995. Second, these values are, for each country, multiplied by their respective coefficients and summed to the constant term. The result is the estimated long-run growth rate.

The long-run growth rates the *BLR approach* generates average 5.2 percent and range from 1.8 percent (Bulgaria) to 11.57 percent (Turkmenistan). These rates are clearly too high and this is because transition economies have higher stocks of physical and human capital and lower rates of population growth vis-à-vis the market economies, at similar levels of development, upon which those least squares coefficients are estimated. By imposing these regression coefficients on transition economies' data, the approach implicitly assumes that the transition countries are structurally identical to market economies at similar levels of development. Indeed, that this crucial assumption remains untested is a major limitation of the *BLR approach*.[6] In order to test this assumption, one needs to estimate the *BLR equations*

[6] There are some other important problems. What the literature calls the "Barro specification" can not be found in Barro's 1991 paper. There is one specification that contains the coefficients shown above (equation 1 in Table 1, pp. 410-11), but it contains three other variables: the sum of the number of revolutions and coups per year, the number of political assassinations per capita per year, and "the magnitude of the deviation of the 1960 PPP value for the investment deflator (U.S.=1) from the sample mean" (Barro, 1991). Although the "Levine and Renelt specification" is in their 1992 paper, this specification does not solely includes variables that are robust in explaining growth. Indeed, the

using transition countries' data. If the resulting coefficients are similar to the ones presented above, then the approach is fully justified.

4. DATA AND METHODOLOGY

The data set constructed for this paper contains all the variables in the two equations underlying the *BLR approach* —namely, initial per capita income, per capita GDP growth rates, population growth,[7] gross domestic investment (as a share of GDP), gross enrollment ratios in primary and secondary school, and general government expenditures and consumption (as a share of GDP)— and covers the period 1989 to 1998. Table 1 gives basic statistics, sources, coverage, and number of missing observations per series, Table 2 shows the countries in the sample, and Table 3 has the correlation matrix.

[Insert Table 1 about here]

A caveat about data quality and comparability is needed. These problems are many and are well documented (Bartholdy, 1997). Socialist statistical offices had a comparative advantage in measuring quantities, and were ill equipped to deal with issues like price changes (let alone inflation) and unemployment. Moreover, the systemic transformation meant a radical change in incentives from fulfilling plan targets to evading taxes, from over-reporting to under-reporting output. The combination of these difficulties in measuring quantity and prices has led De Broeck and Koen to note that, in transition, there is no "single, true real GDP series" (2000). Last, but not least, the initial years of the transition witnessed an

results in Levine and Renelt's Table 1 (1992, p. 947) indicate that population growth is not a "robust" growth determinant.

[7] Notice that population growth does not fully reflect changes in the labor force caused by *inter alia* differences in participation rates and migration. The latter was sizeable in some countries in the early 1990s, like Albania or Armenia. I am thankful to an anonymous referee for the latter point.

extraordinary explosion in size of the "hidden" economy. All these factors should be kept in mind when examining the results below.

One difficulty in identifying which countries are "at similar levels of development" is that while the transition economies started out clustered in the "upper-middle income" group[8], ten years later they are found widely spread over the rank of countries (by their level of development). This can be fully grasped if we name the "new neighbors" of the transition economies. Among transition countries, Tajikistan and the Kyrgyz Republic have the lowest GDP per capita in 1998 (followed by Moldova), while Slovenia has the highest (followed by the Czech Republic and Croatia, respectively). The "median" transition economy is Kazakhstan. Bangladesh is the developing country with the same GNP per capita in 1998 as Tajikistan and the Kyrgyz Republic. Haiti and Mauritania are the countries with the same GNP per capita in 1998 as Moldova. At the other extreme of this distribution, the country immediately above Slovenia is Portugal, and the one immediately below is Argentina. The Czech Republic ranks between Uruguay and Chile, while Croatia ranks between Brazil and Hungary. The dispersion in the transition group increased substantially since 1989 and this list of countries in close positions clarifies the difficulty in establishing the relevant comparators or groups of countries at similar levels of development.[9] Most of the former

[8] The World Bank ranks countries by their level of economic development, using as criterion (1998) GNP per capita (exchange rates conversion). "The groups are: low-income, $760 or less; lower-middle-income, $761-$3,030; upper-middle-income, $3,031-$9,630; and high-income: $9,361 or more" (World Bank, *1999/2000 World Development Report*, p. 291). According to this *Report*, Slovenia is the only "high income" country in this sample of 25 transition economies.

[9] As for levels of development, one can argue that income per capita alone does not do justice to the years of effort to improve social conditions (e.g., education and health) that characterized the socialist regimes. UNDP (1998) ranks 174 countries according to their "human development index" (which

Soviet Union countries end this period as “low income” or “lower-middle income,” while the majority of the Central and Eastern Europeans (and Baltic) countries in the late 1990s are classified as “upper-middle income” economies.

Clearly, dispersion increased because of large differences in performance. Table 2 shows annual real GDP growth rates. A few remarks are in order. First, as it can be seen from the last column, so far only three countries have surpassed the 1989 level of per capita GDP. Second, the countries of Eastern Europe experienced output declines that turned out to be much smaller than the ones observed, at a *later* date, among the CIS economies. And finally, there seems to be a “Baltic puzzle”: although Estonia, Latvia and Lithuania all had output contractions comparable to other CIS countries, their recovery was much faster.

[Insert Tables 2 and 3 about here]

What can explain these differences? The expectation is that at least part of the answer can be found in the variables underlying the *BLR approach*, namely in investment rates, population growth, school enrollment ratios,[10] and government consumption. Two remarks: one is that this set of variables does not fully capture policy differences, at least not as commonly understood in the literature reviewed above. The other refers to the share of government consumption in GDP. In the study of the effects of government consensus is

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reflects, in addition to income, life expectancy and education attainment.) This sample of 25 transition economies stretches from the 37th (Slovenia, immediately preceded by Argentina and followed by Uruguay) to the 118th place (Tajikistan, immediately preceded by Cape Verde and followed by Honduras). The median country is Macedonia (in 80th place), immediately preceded by Lithuania and followed by Syria. In sum, the dispersion seems to have increased also along these lines.

[10] These are gross enrollment rates for “basic education” (ISCED 1 and 2) and “secondary education” (ISCED 3). The former is often called "compulsory schooling" and normally lasts from age 6 or 7 to age 14 or 15. Often divided into primary (to age 10) and lower secondary levels.

being built upon the notion that different types of expenditures have different effects on economic growth.[11] Yet notice that in the *BLR approach* (in the "Barro specification" in particular) it enters with a negative sign.

The *BLR approach* confines methodological choices: the two equations are to be estimated by ordinary least squares on cross-sectional data, correcting for heteroscedasticity. However, restricting the analysis to the cross-sectional dimension (or not extending it into the time-series dimension) clearly does no justice to "transition." How can we take into account "transition features" without leaving the *BLR framework*? In other words, how can we allow for the typically V-shaped short-run output dynamics as well as for the effects of different policy choices without adding variables? One solution is to re-base the *BLR variables* on different time scales,[12] another is to estimate the *BLR equations* for downturn and recovery phases separately. These allow using pooled OLS while attending to problems of simultaneity (between growth and policies as discussed by Heybey and Murrell, 1999), omitted variables as well as the capture of the "phase effect."

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[11] See Devarajan, Swaroop and Zou (1996) and references therein. Analyses focusing on transition economies include Chu and Schwartz (1994) and Campos and Coricelli (2000).

[12] The results discussed in the next section were subjected to four different of time scales: the first is "transition time" from Berg et al. (1999) with year zero denoting the "year in which central planning was decisively abandoned." The second is "years of transition" following Blanchard (1997), with year one indicating the year of the most significant fall in industrial output. Note that Blanchard studies just a few countries, so data from the U.N Economic Commission for Europe (1996) were used to identify this year for the complete sample. The third is "post-reform time" from Aslund et al. (1996), with zero marking the year of most intense reform. The fourth and last time scale used was "stabilization time" from Fisher et al. (1998), with year zero being the year of the introduction of the stabilization program.

5. BACK TO THE FUTURE

The objective of this section is to estimate the equations underlying the *BLR approach* using the data set discussed above. It is important to keep in mind that the results that follow are not extremely robust: the exclusion of certain countries in some runs, or the inclusion of some variables in certain specifications, alters the statistical significance levels of many coefficients. Therefore, we found it important to report in addition to the "original BLR equations," results for a number of stripped as well as enlarged versions of these equations to allow some latitude in judgement.

We start by exploring the cross-sectional dimension of our data set, for the case of the "Barro specification" (Table 4). We follow Barro (1991) and report ordinary least squares estimates on averages for all variables over the period 1990-1998. Reading the table from top to bottom, notice first the rather few statistically significant coefficients. This is surprising because, after all, these variables have been identified as long-run (growth) determinants and one would expect that they would play a role, at least in a cross-sectional frame. Examining the individual columns (variables), notice that the sign of the initial income coefficient is positive (although not often statistically significant) in all five specifications contrary to the expectation nested in the *BLR approach*. On the positive side, basic education carries the expected sign and is statistically significant throughout.[13] Although not statistically significant, it is interesting to note that both "secondary education" and "government consumption" carry signs that are in stark contrast to the signs postulated by the *BLR approach*.[14] Also worth mentioning is that the CIS dummy variable (which assumes the value

[13] However, if UNESCO or World Bank primary education figures are used instead, the coefficient becomes statistically insignificant. These are available from the author upon request.

[14] If instead of government consumption, government expenditures is used, the relevant coefficient becomes statistically significant (and remains positive).These results are available from the author

of 1 for CIS countries, and zero otherwise) carries the expected sign and is statistically significant.

[Insert Table 4 about here]

Table 5 shows results for the cross-sectional dimension of the "Levine and Renelt specification." Once again, the lack of statistically significant coefficients is evident. One exception is the coefficient on initial income, but it carries an unexpected positive sign and is statistically significant in the first two specifications. The sign for secondary education is also opposite to what we should expect from the *BLR approach*. Notice that the introduction of the CIS dummy (a step known to quiver most of the results in the literature) turns the coefficient on investment into statistical significance (a very rare result in the literature).[15]

[Insert Table 5 about here]

Because the results above vigorously contradict the *BLR* findings, it is worth giving the data one more chance. This is accomplished by exploring the time-series dimension in the data in order to investigate whether in a shorter-run frame the *BLR results* would appear. The explicit cost of this choice is that the theoretical underpinnings that were guiding the previous findings do not hold here. The theory associated with the *BLR equations* focuses on the determinants of long-run economic growth and has very little to say about short-term fluctuations, making the findings that follow exploratory.

Table 6 shows how the Barro specification performs for a pooled ordinary least squares estimation on cross-section time-series annual data. The first noteworthy result is that the coefficient on initial income is always positive and (in one equation) statistically

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upon request.

[15] Notice that these results do not change in any meaningful way for the two BLR equations if these averages are calculated only for the recovery period. These are available from the author upon request.

significant (against the *BLR* expectation). Note that the CIS dummy variable still carries the expected sign and is statistically significant. The major changes, vis-à-vis the cross-sectional results above, are that the coefficient on basic education is not statistically significant and the coefficient on secondary education becomes statistically significant (and shows the expected positive sign).[16]

[Insert Table 6 about here]

Table 7 shows how the Levine and Renelt specification performs for cross-section time-series data. In light of our other results, it performs rather well and despite the very low Adjusted-R^2's, only one coefficient carries the unexpected sign (namely the one for initial income). The coefficients on secondary education, investment and on the CIS dummy are all statistically significant and carry the expected signs.[17]

[Insert Table 7 about here]

Until now, the analysis has not fully taken into account the "transition features" previously mentioned. In order to allow for the typically V-shaped short-run output dynamics as well as for the effects of different policy choices without leaving the *BLR framework* we estimate the *BLR equations* for downturn and recovery phases separately.[18]

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[16] The results for data re-based using any of the four different time scales discussed in the previous section are qualitatively similar to these. They are not reported for the sake of space but are available from the author upon request.

[17] Notice that if UNESCO secondary education figures are used instead, the coefficient on secondary school and investment become statistically insignificant (and adding the CIS dummy makes only the coefficient on investment statistically significant). If World Bank secondary education figures are used instead, the coefficient on secondary school becomes statistically significant, but it carries a negative sign. These results are available from the author upon request.

[18] I am thankful to an anonymous referee for these suggestions.

Tables 8 and 9 show how the Barro's specification perform for the downturn and recovery phases, respectively. One first issue to notice is that the coefficients on secondary education and, surprisingly, the CIS dummy are statistically insignificant in the downturn as well as in the recovery. Also interesting is that that the coefficient of government consumption is always positive (although statistically significant only during the downturn phase) and that the coefficient on "basic education" is positive in the downturn (and often statistically significant) but negative in the recovery (also often statistically significant).

[Insert Tables 8 and 9 about here]

Finally, Tables10 and 11 show how the Levine and Renelt's specification perform for the downturn and recovery phases, respectively. One first observation is the complete absence of statistically significant coefficients for the recovery phase. Also notice that when one separates downturn from recovery, the CIS looses explanatory power considerably. Last, it is noteworthy that the coefficient on investment is positive and statistically significant in the downturn, but in the recovery it is never statistically significant.

[Insert Tables 10 and 11 about here]

6. CONCLUDING REMARKS

The objective of this paper was to discuss the limitations of the available methods for assessing the growth prospects transition economies face and, in doing so, investigate growth determinants for these economies. We surveyed the literature and identified the *BLR approach* as the favored methodology in use to estimate or forecast long-run growth rates in transition economies. Closer examination revealed many problems with the approach, to which the literature does not seem attentive. In particular, a crucial assumption remain untested, namely that the transition countries are structurally identical to market economies at similar levels of development. In this paper, we tested it and found little evidence in its support. As for the

BLR approach as a whole, we found that the coefficients in the *BLR equations* vary widely when estimated on transition countries' data. There are indeed very few robust results. There is some evidence that higher initial incomes are associated with higher rates of economic growth and there is also some evidence that basic education and investment have also been positively associated with economic growth. However, these are clearly exceptions: the *BLR approach* does not perform well for the transition countries at all. This strengthens the case for making its costs and shortcomings explicit all the more pressing.

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Table 1
Basic statistics, sources, and coverage

Variables	Period	Mean	Standard Deviation	Minimum	Maximum	No. Missing	Source(s)
GNP per capita PPP, US$	1989	5593	2111.8	1400	9200	0	De Melo, Denizer, Gelb, and Tenev, (1997)
GDP per capita, current dollars	1989	2668	1397.3	723	6052	0	WDI 2000 and ECE 1995
GDP per capita, current dollars	1990-1998	2135	1784.5	220	9851	5	WDI 2000, and ECE 1995.
GDP growth, annual, %	1990-1998	-4.3	10.2	-52.6	12.7	0	EBRD
Gross primary school enrollment (1), %	1990-1995	94.8	9.1	76.0	118.0	94	UNESCO (1997)
Gross primary school enrollment (2), %	1990-1996	96.0	8.7	75.9	121.8	76	WDI 2000
Basic education gross enrollment, (3) %	1990-1998	91.6	5.1	78.8	99.8	11	UNICEF's TransMONEE
Gross secondary school enrollment, (1) %	1990-1995	80.8	12.9	35.0	102.0	84	UNESCO (1997)
Gross secondary school enrollment, (2) %	1990-1997	85.1	11.8	37.5	103.8	76	WDI 2000
General secondary gross enrollment, (3) %	1990-1998	26.5	7.6	8.8	45.6	15	UNICEF's TransMONEE
Gross domestic fixed investment, % GDP	1990-1998	20.7	7.0	1.6	44.3	25	WDI 2000, WDI, WDR
Population growth, annual, %	1990-1998	0.2	1.2	-4.9	6.9	0	WDI 2000
Government consumption, % GDP	1990-1998	17.6	5.0	5.9	29.4	16	WDI 2000, WDR
Government expenditure, % GDP	1990-1998	39.3	11.6	10.4	82.9	26	UNICEF's TransMONEE

Table 2
25 Transition Countries, initial (1989) GNP level and growth rates

	1989 PPP level	1990	1991	1992	1993	1994	1995	1996	1997	1998	Estimated level of real GDP in 1998 (1989=100)
Albania	1400	-10.0	-27.7	-7.2	9.6	9.4	8.9	9.1	-7.0	8.0	86
Bulgaria	5000	-9.1	-11.7	-7.3	-1.5	1.8	2.1	-10.1	-7.0	3.5	66
Croatia	6171	-7.1	-21.1	-11.7	-8.0	5.9	6.8	6.0	6.5	2.3	78
Czech Republic	8600	-1.2	-11.5	-3.3	0.6	3.2	6.4	3.8	0.3	-2.3	95
Estonia	8900	-8.1	-13.6	-14.2	-9.0	-2.0	4.3	3.9	10.6	4.0	76
Macedonia	3394	-9.9	-7.0	-8.0	-9.1	-1.8	-1.2	0.8	1.5	2.9	72
Hungary	6810	-3.5	-11.9	-3.1	-0.6	2.9	1.5	1.3	4.6	5.1	95
Latvia	8590	2.9	-10.4	-34.9	-14.9	0.6	-0.8	3.3	8.6	3.6	59
Lithuania	6430	-5.0	-6.2	-21.3	-16.0	-9.5	3.5	4.9	7.4	5.2	65
Poland	5150	-11.6	-7.0	2.6	3.8	5.2	7.0	6.1	6.9	4.8	117
Romania	3470	-5.6	-12.9	-8.8	1.5	3.9	7.1	4.1	-6.9	-7.3	76
Slovakia	7600	-2.5	-14.6	-6.5	-3.7	4.9	6.9	6.6	6.5	4.4	100
Slovenia	9200	-4.7	-8.9	-5.5	2.8	5.3	4.1	3.5	4.6	3.9	104
CEEB		*-6.6*	*-10.7*	*-3.6*	*0.4*	*3.9*	*5.5*	*4.0*	*3.6*	*2.4*	*95*
Armenia	5530	-7.4	-17.1	-52.6	-14.8	5.4	6.9	5.8	3.1	7.2	41
Azerbaijan	4620	-11.7	-0.7	-22.6	-23.1	-19.7	-11.8	1.3	5.8	10.1	44
Belarus	7010	-3.0	-1.2	-9.6	-7.6	-12.6	-10.4	2.8	10.4	8.3	78
Georgia	5590	-12.4	-20.6	-44.8	-25.4	-11.4	2.4	10.5	110	2.9	33
Kazakhstan	5130	-0.4	-13.0	-2.9	-9.2	-12.6	-8.2	0.5	2.0	-2.5	61
Kyrgyztan	3180	3.0	-5.0	-19.0	-16.0	-20.0	-5.4	7.1	9.9	1.8	60
Moldova	4670	-2.4	-17.5	-29.1	-1.2	-31.2	-3.0	-8.0	1.3	-8.6	32
Russia	7720	-4.0	-5.0	-14.5	-8.7	-12.7	-4.1	-3.5	0.8	-4.6	55
Tajikistan	3010	-1.6	-7.1	-29.0	-11.0	-18.9	-12.5	-4.4	1.7	5.3	42
Turkmenistan	4230	2.0	-4.7	-5.3	-10.0	-18.8	-8.2	-8.0	-26.1	4.2	44
Ukraine	5680	-3.4	-11.6	-13.7	-14.2	-23.0	-12.2	-10.0	-3.2	-1.7	37
Uzbekistan	2740	1.6	-0.5	-11.1	-2.3	-4.2	-0.9	1.6	2.4	3.3	90
C I S		*-3.7*	*-6.0*	*-14.2*	*-9.3*	*-13.8*	*-5.2*	*-3.5*	*0.9*	*-3.5*	*53*
ALL		*-5.0*	*-8.1*	*-9.5*	*-5.0*	*-6.0*	*-0.5*	*-0.2*	*2.0*	*-1.2*	*65*

Source: see text.

Table 3
Correlation matrix (n=24)

	Initial Income	Growth	Basic education	Secondary Education	Government Consumption	Government Expenditures	CIS dummy	Investment
Growth	0.3811							
Basic education	0.3378	0.6915						
Secondary Education	-0.1464	-0.1870	-0.1287					
Government Consumption	0.4126	0.3682	0.1348	-0.1941				
Government Expenditures	0.3223	0.6009	0.4905	-0.3569	0.4499			
CIS dummy	-0.3906	-0.6389	-0.5011	0.2319	-0.2249	-0.4622		
Investment	0.2473	0.3099	0.4591	-0.0873	0.3446	0.3327	0.0019	
Population growth	-0.5327	-0.1450	-0.3084	0.1333	-0.0288	-0.1077	0.5196	0.1355

Table 4
Cross sectional dimension, Barro specification
Dependent variable is GDP growth.

	Constant	Initial Income	Basic education	Secondary Education	Government Consumption	CIS dummy	Adj. R2	N
Regression 1	-7.78 *** 1.59	.0011 ** .0004					0.1222	25
Regression 2	-60.17 *** 11.27	.0005 .0004	.59 *** .12				0.4671	25
Regression 3	-57.51 *** 12.68	.0004 .0004	.58 *** .13	-.063 .063			0.4535	25
Regression 4	-60.89 *** 12.01	.0002 .0005	.589 *** .12	-.055 .065	.177 .147		0.4609	25
Regression 5	-47.09 *** 11.85	.0001 .0005	.448 *** .11	-.018 .064	.172 .148	-2.854 * 1.489	0.5446	25

Notes: *** denotes statistically significant at the 1% level, ** denotes statistically significant at the 5% level, * denotes statistically significant at the 10% level. In the first rows are the coefficients, and below are standard errors (corrected for heteroskedasticity).

Table 5
Cross sectional dimension, Levine and Renelt specification
Dependent variable is GDP growth.

	Constant	Initial Income	Population growth	Secondary Education	Investment	CIS dummy	Adj. R2	N
Regression 1	-7.53 *** 1.97	.001 * .0005	-.217 .829				0.0846	25
Regression 2	-4.97 3.16	.001 * .0005	-.085 .811	-.095 .082			0.0678	25
Regression 3	-8.49 * 4.29	.008 .0005	.041 1.23	-.075 .072	.161 .136		0.0430	24
Regression 4	-7.02 ** 3.15	.0005 .0003	1.57 1.16	-.007 .074	.163 * .092	-5.54*** 1.64	0.4405	24

Notes: *** denotes statistically significant at the 1% level, ** denotes statistically significant at the 5% level, * denotes statistically Significant at the 10% level. In the first rows are the coefficients, and below are standard errors (corrected for heteroskedasticity).

Table 6
Panel dimension, Barro specification
Dependent variable is GDP growth.

	Constant	Initial Income	Basic education	Secondary Education	Government Consumption	CIS dummy	Adj. R2	N
Regression 1	-5.79 *** 1.22	.0008 ** .0003					0.0154	195
Regression 2	-32.87** 18.19	.0004 .0004	.301 .203				0.0399	184
Regression 3	-32.16 * 18.46	.0007 .0004	.258 .202	.111 .084			0.0362	180
Regression 4	-33.53 * 19.12	.0006 .0004	.254 .203	.176 ** .084	.038 .151		0.0361	169
Regression 5	-17.72 21.28	.0003 .0004	.114 .222	.184 ** .083	-.003 .154	-3.906** 1.761	0.0553	169

Notes: *** denotes statistically significant at the 1% level, ** denotes statistically significant at the 5% level, * denotes statistically Significant at the 10% level. In the first rows are the coefficients, and below are standard errors (corrected for heteroskedasticity).

Table 7
Panel dimension, Levine and Renelt specification
Dependent variable is GDP growth.

	Constant	Initial Income	Population growth	Secondary Education	Investment	CIS dummy	Adj. R2	N
Regression 1	-5.36*** 1.18	.0007 ** .0003	-.736 .543				0.0169	195
Regression 2	-9.143*** 2.704	.001*** .0003	-.971* .544	.127 .085			0.0342	186
Regression 3	-14.29*** 3.659	.0007 * .0003	-.835 1.08	.173* .092	.242 ** .122		0.0483	170
Regression 4	-10.876*** 3.612	.0001 .0003	-.109 1.08	.175* .089	.251 ** .122	-5.02*** 1.57	0.0861	170

Notes: *** denotes statistically significant at the 1% level, ** denotes statistically significant at the 5% level, * denotes statistically Significant at the 10% level. In the first rows are the coefficients, and below are standard errors (corrected for heteroskedasticity).

Table 8 Panel dimension, Barro specification, data for downturn only. Dependent variable is GDP growth.								
	Constant	Initial Income	Basic education	Secondary Education	Government Consumption	CIS dummy	Adj. R2	N
Regression 1	-12.67*** 1.518	.0007 .0005					0.0042	106
Regression 2	-44.06 ** 19.642	.0002 .0006	.356 .219				0.0219	104
Regression 3	-45.62** 20.40	.00006 .00089	.397 * .219	-.059 .108			0.0184	100
Regression 4	-52.91 ** 21.67	-.00004 .00084	.425 * .230	-.044 .114	.276 * .143		0.0330	91
Regression 5	-51.41** 22.96	-.0001 .0008	.412 * .241	-.039 .113	.273 * .144	-.436 1.762	0.0221	91
Notes: *** denotes statistically significant at the 1% level, ** denotes statistically significant at the 5% level, * denotes statistically significant at the 10% level. In the first rows are the coefficients, and below are standard errors (corrected for heteroskedasticity).								

Table 9
Panel dimension, Barro specification, data for recovery only.
Dependent variable is GDP growth.

	Constant	Initial Income	Basic education	Secondary Education	Government Consumption	CIS dummy	Adj. R2	N
Regression 1	5.18*** .491	-.0002* .0001					0.0054	89
Regression 2	17.45** 7.358	.0001 .0001	-.141 * .0819				0.0276	80
Regression 3	16.57 ** 7.51	.0001 .0001	-.149 * .0815	.0567 .0368			0.0395	80
Regression 4	17.94** 7.601	.0001 .0001	-.166** .0811	.0472 .0388	.038 .055		0.0367	78
Regression 5	17.12 * 9.705	.0001 .0001	-.159 .098	.0472 .0392	.043 .062	.194 1.24	0.0239	78

Notes: *** denotes statistically significant at the 1% level, ** denotes statistically significant at the 5% level, * denotes statistically Significant at the 10% level. In the first rows are the coefficients, and below are standard errors (corrected for heteroskedasticity).

Table 10
Panel dimension, Levine and Renelt specification, data for downturn only.
Dependent variable is GDP growth.

	Constant	Initial Income	Population Growth	Secondary Education	Investment	CIS dummy	Adj. R2	N
Regression 1	-12.67*** 1.52	.0007 .0005					0.0042	106
Regression 2	-12.62*** 1.46	.0007 .0005	-.0651 .571				-0.0054	106
Regression 3	-12.23*** 3.54	.0008 .0007	-.209 .573	-.014 .114			-0.0144	100
Regression 4	-14.26*** 4.49	.00003 .00086	-1.58 1.38	-.079 .136	.267 * .139		0.0268	87
Regression 5	-13.17*** 4.34	-.00038 .00092	-1.24 1.46	-.063 .137	.301 ** .138	-2.37 1.81	0.0287	87

Notes: *** denotes statistically significant at the 1% level, ** denotes statistically significant at the 5% level, * denotes statistically Significant at the 10% level. In the first rows are the coefficients, and below are standard errors (corrected for heteroskedasticity).

Table 11
Panel dimension, Levine and Renelt specification, data for recovery only.
Dependent variable is GDP growth.

	Constant	Initial Income	Population growth	Secondary Education	Investment	CIS dummy	Adj. R2	N
Regression 1	5.18*** .491	-.0001* .0001					0.0054	89
Regression 2	5.18*** .497	-.0001 .0001	.012 .324				-0.0061	89
Regression 3	3.31*** 1.21	-.0001 .0001	.063 .35	.061 .037			0.0050	86
Regression 4	3.09 * 1.75	-.0001 .0001	.098 .39	.055 .038	.027 .051		-0.0031	83
Regression 5	2.66 1.76	-.0001 .0001	.007 .426	.055 .038	.031 .05	.667 1.04	-0.0077	83

Notes: *** denotes statistically significant at the 1% level, ** denotes statistically significant at the 5% level, * denotes statistically Significant at the 10% level. In the first rows are the coefficients, and below are standard errors (corrected for heteroskedasticity).

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Zentrum für Europäische Integrationsforschung
Center for European Integration Studies
Rheinische Friedrich-Wilhelms-Universität Bonn

Walter-Flex-Strasse 3
D-53113 Bonn
Germany

Tel.: +49-228-73-1732
Fax: +49-228-73-1809
www.zei.de